

USING MOBILE AUGMENTED REALITY APPLICATION AS A MARKETING STRATEGY IN SOCIAL MEDIA

By: MOHD FIRDAUS BIN MOHD NASIR

11550

Report submitted in partial fulfilment of
the requirements for the
Bachelor of Technology (Hons)
(Business Information Systems)

May 2015

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CERTIFICATION OF APPROVAL

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Approved By:

.....

(Assoc. Prof. Dr Jafreezal Bin Jaafar)

UNIVERSITI TEKNOLOGI PETRONAS
TRONOH, PERAK
May 2015

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

.....

(Mohd Firdaus Bin Mohd Nasir)

ABSTRACT

Using Mobile Augmented Reality Application as a Marketing Strategy in Social Media is a research to know how to improve marketing strategy such as branding and promotion using augmented reality in social media. By using this type of technology, instead of using the traditional and conventional approach, users can attract more customer to buy the product since the promotion is more memorable. This mobile application can scan a certain type of product and it can produce a certain type of animation and information according to the developer. But in this research, we are also taking one step further by absorbing the latest trend of advertising which is social media and instead of a plain advertisement, we are using simple games to attract more customers. The idea came from the trend of mobile games nowadays such as candy crush or flappy bird, and people can compete with their friends in social media such as Facebook and Twitter. The competitive nature that came out from the game will help selling the product as people will look for more entertainment from the advertisement.

As people can see, augmented reality technology had brought promotional events into a whole new level and attention given to the augmented reality advertisements are higher than the conventional advertisement. Furthermore, by now almost every people in the planet have their own smartphone which are mostly capable of using this type of advertisement. This app will be easy to use and more fun for the users and product promotions will also reach a new level of attractiveness. The system's development is based on the modified version of Waterfall Methodology Model called Sashimi Methodology Model. Based on the data gathering and analysis, by using Qualcomm Vuforia (QCAR) as the AR framework, together with unity 3D Pro, Autodesk Maya and Android software Development Kit (SDK). The system is also targeted to users from all ages that have smartphones. As conclusion, this interactive application will solve the ineffectiveness in conventional physical advertisement, thus creating bigger platform for business to acquire more profit.

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1. CHAPTER 1 : INTRODUCTION

This chapter will cover the following topics

- Background of study
- Problem statement
- Objective and scope of study
- Relevancy and feasibility of the project

1.1 Background of Study

When people talk about business, one thing that comes to mind is profit. Nobody wants to be in a business that is declining and at loss. Business firms will find a new way to increase profit and technology is one of the ways to do it. Technological advancement in the past years certainly helps the business to run more effectively. And combining both element, the main idea of the system is to increase profit by using technology. This is where the role of marketing and advertisement come up. Marketing helps business to analyse the best way to gain and retain customer. Various methods can be used in marketing such as promotion, advertisement, pricing and product strategy, and the others. All of them are used to gain the profit through customer satisfaction and not through the sales volume. [1] This statement differentiates between marketing and selling target.

Profit through customer satisfaction is possible to be achieved when great focus being positioned to the advertisement instead of the product and pricing strategies only. [1] Without the visibility from customer's eyes, an excellent product with extremely reasonable price could not attract the customer attention. Thus, advertisement has become the success factor of business performance that influences customer awareness, attitudes and buying behavior. [2]

Augmented Reality can be taken advantage of as to do promotion and advertisement since it can give a more impactful effect on the consumer. This advance technology is also widely used in the android community nowadays. This system can be implemented in android so that it will be practical for all customers. The developer

will be provided with free tools and guideline to develop this open source stack for mobile devices that includes an operating system, middleware and key applications. [3]

As far as advertisement with augmented reality is concerned, users can have a more interactive advertisement as the users can play the game provided to them when they scan the image marker given to them with the product. They can get different games from different types of products and also can give variety of fun to the users. And in this modern community that is full with competitiveness among people, these games can also be played with friends in their social media connection. Users can upload their scores and achievements in the games into Facebook or Twitter and more people will get to know about the product just by looking at the tweet sent by one of his or her friend. Following the flow, more people will buy more products to compete in different games and also they will keep buying the product to keep playing the games because of the people's competitive nature.

There a lot of AR application created for Android. Layar is one of the famous AR applications for markerless-based AR application. Layar is an AR browser used to display layers of digital info in the phone's field of vision to show user the things user cannot see. [4] Instead of Layar, Blippar is also famous to provide AR scene for advertisement used by Tesco. [5] This is the marker-based AR application. There is also Pocket Universe that will tell the user the name of the constellation when pointing the camera to the sky. [4]

1.2 Problem Statement

There are several problem regarding the traditional and the conventional way of promoting products and also how the current augmented reality technology advertisement is doing in the market right now.

The first one is how the conventional type of advertisement is dull and boring thus not giving the customers the reaction that is hoped by the business firms. A research was done in India to and the goal is to study the performance of Amul's Chocolate brand and also how advertisement can affect the sales of a product. [6] After doing market research and surveys, they found out that there are lack of awareness on the chocolate mainly from their targeted market which are children and teenagers. Since teenagers and children are main consumers of chocolate, it is important to have their awareness in the brand so that their sales can go up. The problem mainly is because of the advertisement of the chocolate is located in newspapers and it does not attract people since it has limited colours and dull appearance. People are starting to leave newspaper and get their news from the internet and it hinders the advertisement to go out and impress people.

Due to the above problem, it became such a domino effect to the advertiser because lack of awareness from dull advertisement made the viewer most likely did not remember the brand or even the advertisement they already viewed before. [6] This is because there is no bodily response from the viewer when they viewed the advertisement. The body response is possible to be created by allowing the viewer to interact with the advertisement itself. This implementation will create long-term memory effect from customer side towards the brand name. [7]

Advertisement that cannot give any impression to the customers are considered as weak and it will not leave any awareness to people. A strong advertisement however will affect consumers and it will make them remember the brand and also leads to mouth to mouth promotion. The brand will get widespread recognition if it comes with a strong advertisement and this is what we want to achieve with this app.

Secondly, there are only a small number of research shows that augmented reality and marketing can come together. It is not quite proven that augmented reality can be effective as an advertisement. It hinders the advertisers to invest in the augmented reality advertisement because it requires a lot of money and time to do the advertisement. It is also to prove that even though augmented reality advertisement is already around for 5 years now. [8] it is still does not reach the maturity stage and people are still questioning the reliability. Thus this project is also to prove the effectiveness of augmented reality advertising.

1.3 Objective

The Objectives for this project are

- To create and develop an **interactive and engaging** augmented reality advertising application.
- To **include social media network** into advertisement to attract customers and self-promotion.
- To **enhance sales** of a product using augmented reality application.

1.4 Scope of Study

There are five main elements of this research

- Smartphone
- Android operating system
- Consumer product
- Augmented Reality
- Social Media

1.5 Relevancy of the project

Augmented reality is an up and coming technology and every researcher in the world are striving to make it more stable and reliable and advertisement is the most important element in business that will attract more customers. Combining social media into the equation will help the promotion into a whole new level. As we all know, there are millions of people in Facebook and Twitter and promoting through social media will bring the brand out more than conventional advertisement will do to them. The more people viewed the advertisement, the more people will be interested and subsequently buying the product. People will be interested in the advertisement because it is more interactive and will leave a significant effect on their mind. Furthermore, increase of sales will guarantee more profit. In simple words, augmented reality advertisement will help increase the profit of the business.

1.6 Feasibility of the project within the scope and time frame

Based on the scope mentioned earlier, the scope consists of five elements. The first one is smartphone. Smartphone is chosen as the medium to use the advertisement. It is because according to Gartner.com, the sales of smartphone is the highest and even started to beat the sales of feature phone since 2013. It is proven that almost everyone in the world have a smartphone in their possession. It will help because accessibility is no longer an issue. [9]

Second one is Android operating system. Android is chosen because it holds 66.4 percent of the sales of smartphone. [10] More than half of the people in the world are using Android phones compared to IOS only 19 percent and also other operating systems. This is because the growth of android phones from China and they are using android because it is free and easy to use. Google also provides free development kit to be used along with the development and there are a lot of groups and forum available discussing about issues and facts among the developers. Thus, development in Android will be much easier with these aids and tools.

The third one is the product. Most of the time the advertisements of products are found in newspapers, posters, television and others, but using this marketing strategy, the game is pasted on the packaging of the product and the customers can play it straight from the packaging.

The advertisement will be displayed on the cereal box and targeting on men and women from the age of 15 to 35 years old. This is because most of the Android users come from this range of age. Thus, the tactic used for this advertisement is to deliver the message through this group of people for the large consumer of cereal that most likely not using Android smartphone which is the children. For example, a mother that buys a cereal for her son or daughter will bring smile and happiness to the kids. From the example, it shown that the cereals actually targeted on the children but the advertisement used the mother as the medium to reach this large community of cereal consumer.

Regarding the time frame, the project development will takes two semesters of study which is enough for the author to complete the development of the project. The first semester involving the planning, analysis and design phases and the expected output will help in the implementation phase. At the end of the two semesters, the testing result from the user will be obtained to prove the theory mentioned in this project.

2. CHAPTER 2 : LITERATURE REVIEW

2.1 Marketing

"Marketing is the process whereby companies create value for customers and build strong customer relationships in order to capture value from customers in return". [1] [11] These days, marketing is all the more difficult and the goals concentrating on fulfilling customer needs as opposed to procuring more customers. [1] The significance behind the comprehension of the clients and markets is advertiser ready to plan system particularly to discover the right items for the right clients. Accordingly, business will have the capacity to hold their clients as one of the consistent value. In this way, marketing technique can be translated as the principle component for business to remain gets by in the business sector. [11]

There are various components under marketing in which the integration of them will create a strong marketing strategy. For example, the product strategy, pricing strategy, target market, promotion, advertisement, outlet location, supply chain and the others are the components of marketing. All of the elements are important and failed in one of them will affect the business. Advertising plays big role in order to make the product brand is visible to the customer to support the other marketing strategy. It has been proven that advertising becomes high priority for business to spend more for it. According to ZenithOptimedia, business around the world spent almost USD \$500 thousand for each year of 2007, 2008, 2009 and 2010 for advertisement at major media like newspapers, magazines, television, radio, cinema, outdoor and internet across the regions. [12] This proves that the power of the advertising help business to succeed and many of the businesses put great emphasize on advertisement to escalate the revenues.

2.2 Advertising

Advertising can be defined as "any paid form of non-personal presentation and promotion of ideas, goods or services by an identified sponsor". [1] [13] It is also one of the key factors that affect business performance and influence customer awareness, attitudes and buying behavior. [2] Basically, most of the advertising targeting on three main objectives which are to inform, persuade and remind the audience. [14] It has been proven that the effectiveness of an advertising been measured by the emotional response, long-term memory and bodily response by the customer. [14] Thus, a good advertisement should have all these basic characteristics to be able to attract the customers.

In order to give memorable experience to viewers, advertisers usually take all the advantage to make sure that the advertisement will give emotional response, long term memory and bodily response to the customers. "Hong Ming", the PETRONAS television advertisement successfully won People's Choice Award showing that the advertisement impacted the audience. [15] The advertisement is about the various ethnics in Malaysia and touches audience's heart because even children become best friend from different races. On the other hand, DIGI uses 'Yellow Man' as mascot in all of their advertisement and made audience easily remember DIGI because of it. The advertiser used the advantages from the television features by using interesting song to make the advertisement easier to be remembered and gave bodily response to the audience that tend to tap their feet when listening to the song. [16]

There are different media can be utilized for publicizing like daily paper, TV, web, radio, magazine, open air media and many more. Each of the promotion media has their own particular points of interest and weaknesses. TV promotion is anything but difficult to convey and offers effect to the group of onlookers as a result of the music and visual impact gave. This makes it less demanding to convey the ad message with sight, sound and movement impacts and get the gathering of people consideration also. Notwithstanding, physical commercial is distinctive contrasted with the TV ad (business).



Figure 1 : The Yellow Man in DiGi Advertisements left a great impression on the marketing campaign.

Source : <http://blog.saimatkong.com/blog/happy-malaysia-day-1malaysia-digi-ads/>



Figure 2 : Tan Hong Ming in the PETRONAS advertisement won gold medal at Cannes in 2008 because of his memorable role.

Source : <http://theinspirationroom.com/daily/2008/colour-blind-children-in-malaysia/>

2.3 Physical Advertisement

Physical advertisement can be defined as "advertisement with all these properties like durable, personal and dimensional". Physical advertisement target on specific group and communicate with the targeted group over the time. It also able to be touched, smell and has its height and weight. [3] Fundamentally, physical promotion incorporates the newspaper, magazine, brochure, fliers and newsletter. The majority of the physical advertisement in the daily paper experiencing issues to contend among the greater part of the advertisement bunches in spite of the fact that it is exceptionally reachable for the whole group or custom gathering of individuals. Also, physical commercial without a doubt does not have music and high visual impact with a specific end goal to persuade the crowd. Thus, conventional physical advertisement depends on the brand name and the size of advertisement slot used in the newspaper to attract the readers. Physical advertisement is not really successful to give bodily response to the viewer because of this limitation especially in term of no interaction between the viewer and the advertisement.

However, the most successful physical advertisement is the magazine and the wrapper or packaging of the product. The advertisement will be able to get high reader involvement and attention because the reader paid it and they will appreciate every single thing on the magazine or the package itself. [17] Regardless of the fact that the ad size is little, it will at present emerge on the grounds that it got the high viewer inclusion. Also, as opposed to concentrating on the general group and failed toward the day's end to get any client, the two are better in centering the niche sector. Accordingly, the promotion in the magazine or the packaging of the item normally suit with the viewer preferences.

Product packaging is also considered as the advertising strategy because the early perception of the customers towards the product is created based on the packaging itself. [18] Different products have different strategies of packaging in order to give the best first impression to the customers. The quality of packaging will attract the attention of the buyers and generate the revenue as well. As a result, the effectiveness of advertising through packaging will create long-term memory towards the product. For example, the Brazilian drink called Smirnoff Caipiroska is using a very creative packaging for their product as one of the methods to advertise their product. They created the bottles with lemon wrappers for the lemon flavors and customers need to peel the bottle's wrapper before they can open and drink it. [19] As the effect, customers will feel more connected to the product because of bodily response by peeling the bottle.



Figure 3 : Smirnoff Caipiroska in peelable bottle as Smirnoff is advertising through their packaging

Source : <http://www.thedieline.com/blog/2011/3/31/smirnoff-caipiroska-peelable-bottle.html>

The problem with advertisement right now is it is not memorable enough to attract more customers. Even though the product itself can sell, but advertisement should be more than that. Advertisement should be able to increase awareness about the product, attract them to buy it and simultaneously increasing the profit of the business.

2.4 Augmented Reality

Augmented reality (AR) is related to the concept of virtual reality (VR). Both of the concepts "enable a person to experience and explore interactively, predominantly through his or her sense of vision, but also via studio, tactile and other forms of feedback". [20] The difference between them is that Virtual Reality is going towards the creation of a new virtual environment while Augmented Reality is blending real world with virtual aspects. [20]

To start off with the history, the term augmented reality was first used for 'Virtual Fixtures' and 'KARMA' project in 1992. US Air Force used Virtual Fixtures to assist in completing their task without reading the manual. Same goes to KARMA or Knowledge-based Augmented Reality for Maintenance Assistance. KARMA also uses AR to show the real time instruction through the augmented scene. [8] However, the first AR project dated back to 1957 but there was no specific term given to it. The use of augmented reality is slow until the year 2000 when ARToolkit is available in the market for free. 8 years later in 2008, the first AR application for Smartphone was created. After ARToolkit has been ported to Adobe Flash (FLARToolkit), AR is getting famous and widely used until today.



Figure 4 : Louis Rosenberg testing the Virtual Fixtures Project

Source : http://en.wikipedia.org/wiki/Louis_B._Rosenberg

There are three types of augmented reality widely used which are the marker-based AR, markerless AR and Layar Goggles. Markerless AR and Layar Goggles is harder to develop because it involves a lot of computing methods for the developer. The camera used to capture the real time environment allows user to point and scan anywhere in the world to get the AR scene. Meanwhile, marker-based AR only functioning when the camera is pointed to the marker. It needs to be separated from the rest of the image once the camera captured nit, in order to extract the marker contour. Based on the contour extracted, it enables the translation matrix to be calculated and applied on top of the image captured earlier. [20] Basically, this is the general workflow for marker-based AR applications.



Figure 5 : Marker-based AR will detect a marker and produce animation on top of it

Source : <http://www.alife-studios.com/portfolio>



Figure 6 : Markerless AR in PlayStation 4

Source : <http://winfuture.de/videos/Spiele/PlayStation-4-Neues-Video-zu-The-PlayRoom-10585.html>

As conclusion, AR technology can be used to mix the real world with the virtual world to make an effective animation for the physical advertisement especially in the context of product advertisement. The augmented 3D object created on top of the marker helps in enhancing reader experiences when viewing the advertisement. This should also align with the characteristic of effective advertisement that been measured by the emotional response, long-term memory and bodily response by the customer toward the advertisement. [14]

2.5 Augmented Reality in Social Media

Ever since Facebook, the social networking is considered as one of the most important medium to connect with other people. Augmented reality has made a ton of progress subsequent to its first utilize. The innovation which was essentially utilized for games is currently progressively being utilized as a part of retail, pharmaceutical and numerous different areas. Applications and gadgets are continually being produced by distinctive organizations to earn more consideration from customers. Then again, social networking is an attempted and tried equation for drawing purchasers' attention for any item and service. At the point when this stunning innovation and the sublime online platform are joined, they are similar to a match made in heaven. [21]

Positive word of mouth has dependably been an in number element for the accomplishment of any service of product, be it in true or in advanced world. These days, individuals are keen on sharing details of their everyday life with others through social networking channels. This conduct runs truly well with augmented reality, particularly in the event of retail advertising. At the point when individuals like any AR ad for any product, they would doubtlessly need to impart it to their loved ones. This is conceivable through social media. [21]

Social networking and augmented reality are considerably more important during a period when showrooming is a typical issue in the retail business. In the event that customers can join with the brand and get great arrangements, they are liable to make their buy from the store itself. AR will help them to unite with the brand and they are most likely to share the AR content through social media, thereby increasing the chances of sales. AR and online networking together is a potential promoting tool. It is also important to put social sharing facilities in the AR scene so that users can just share with other people freely. [21]

2.6 Proposed Solution

The main challenge to product advertising nowadays is to deliver the advertisement in the most interesting and interactive way so that it will help people to remember the brand more. This subliminal kind of marketing is important to achieve business and marketing goals. By taking the advantages of technological advancement, this challenge is possible to be countered easily to make advertisement become more effective and lead to the business growth.

The system developed by the author can maximize the advertising effectiveness by using augmented reality technology to make the advertisement come to life. By using QCAR as the AR framework, when pointing Android phone camera to the marker at the cereal box, user will be able to see the freeze advertisement become alive and able to be interacted with such like viewing the promotion, drop a comment and many more.

The more interesting part is when user is pointing the camera towards the game marker, they can play a simple game and they can compete with their friends in social network by sharing the game or uploading the score screen. The game is interesting and will be able to attract more customers to try the new technology embedded in their daily household product.

3. CHAPTER 3 : METHODOLOGY

For any software development it is an essential to plan well the project by gathering the requirement before designing and implementing the software. Different methodologies have been created to cater different needs of different project in a specific duration of time.

Thus, this chapter will elaborate more about:

- Choosing System Development Methodology
- Planning, Analysis, Design and Implementation Phases
- Tools
- Key Milestone

3.1: Choosing Software Development Methodology

It is important to plan well the project for any software development by gathering the requirements before designing and implementing the project. This

In this project, the modified Waterfall Methodology or Sashimi Model is used for the software development. Based on the software development process, each of the phases will be developed systematically and sequentially from one to another in a downward fashion and there will be an overlapped between the phases, it means that the analysis phase starts before the planning phase is finalized, design before analysis is completed and et cetera.

Based on the methodology, it was extremely urgent to recognize the framework requirements so as to minimize the requirement changes as the task continued. Along these lines, implementation phase was less demanding since the planning, analysis and design phases were specified in detail before the implementation phase begin. The overlapped enabled two phases to be run simultaneously and decrease the task duration. Furthermore, programming will have the capacity to adjust the progressions amid the overlapping stages for any software improvements because it allowed more regression. [16] The overlap in the middle of outline and execution stage empowered

different tools to be tried to expand the product testing and facilitate the debugging process to satisfy each of the functional and non-functional requirement criteria.

3.2: The Phases

3.2.1 Planning Phase

In the planning phase, background of study has been conducted thoroughly. Based on the prior studies, several challenges are identified as the main problems in advertising. To get more understanding about the topic in depth, several journals, website, books and article is reviewed. The problems identified also need to be proven correct and supported by various sources.

For technical research, the advantages and disadvantages on the current product available in the market today which failed to counter the addressed problem above need to be recognized. The objectives and scope of study identified, help to give direction to the project on the expected output at the end of the software development. All of the medi4 tools and knowledge require along the project need to be develop or polish. There are many tutorials in the web explained the step by step guidance for beginners to learn about Android development, QCAR, Android A& ARToolkit and the hardware. Google groups for Android and QCAR development also available for any discussion related to the issues and problems found among the community.

In addition, the feasibility analysis also required to assess the project capabilities to be completed. The organizational analysis also important to ensure the expected product will be used by the end user and align with the problems and needs. The most important analysis is the technical analysis whereby developer needed to identify how possible it is to develop the application. Taking technology familiarity into consideration, the product should not focus on the right customer to be targeted instead; developer should ensure that this application is the right product for the customer.

3.2.2 Analysis Phase

In the analysis phase, the requirement is listed to understand clearly several important questions like who, what, when, and where will the application be. Based on the problems identified in the planning phase, the functions of the application will be identified together with the user of the application. In this phase, developer should understand very well about the project and the expected application to be developed.

In the same time, along the progress of the project, questionnaires will be distributed by using random sampling to prove the hypothesis created in this paper is correct. The questionnaire will cover on the responses of the targeted people toward AR advertisement and show the effectiveness of using AR in food industry advertisement. Since the methodology used is Sashimi Model, the design part already started meanwhile the questionnaire is still in progress. This situation has shown the overlapped between analysis and design phase. Consequently, the result of the questionnaires that will be acquired in the future will help to improve the existed design. The result of the questionnaire will be discussed in the next chapter.

For the current design, the requirement gathering can be divided into several key aspects that relate to the technical management of the project either functional or non-functional requirements

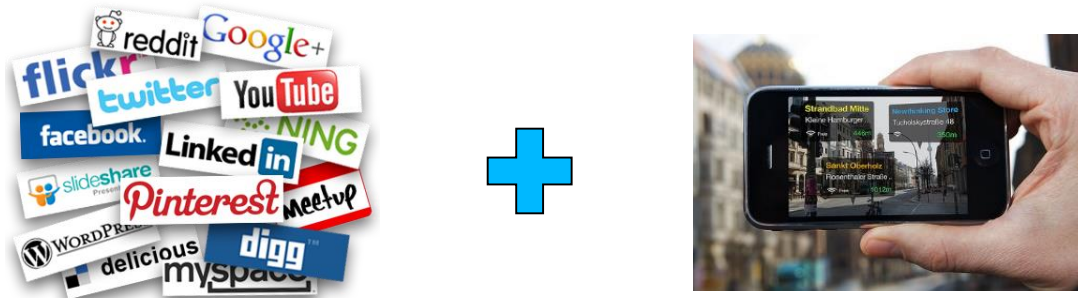
ID	Function 1: Ability to augment the advertisement in the real world
AREA	Functional (For User)
DESCRIPTION	The application should be able to make the freeze advertisement in the printed media comes alive when pointing Android phone camera to the marker provided.

ID	Function 2: Ability to play games
AREA	Functional (For User)
DESCRIPTION	The application should allow the user to play games when pointing Android phone camera to the bottom side of the cereal box.

ID	Function 3: Ability to see Promotion
AREA	Functional (For User and Web Administrator)
DESCRIPTION	The products or services promoted at the advertisement are available in the form of coupons or tickets once the user viewed the AR advertisement in certain time. Before that, user is linked to the advertiser web site to get more details about the advertisement. This will require internet connection for the function to work properly.

ID	Function 4: Ability to link to the website
AREA	Functional (For User)
DESCRIPTION	The application should allow the user to link the users to their own social network such as Twitter and Facebook for sharing purposes

3.2.3 Design Phase



The game created for this project is a simple Find Hidden Object game and using Nestle product Koko Krunch as the case study. The cereal type product is chosen because cereal box has a big flat surface and it is easier to put the game marker on a flat surface. Several Koko Krunch related items were pasted on a picture and users will have to find hidden items in the picture by clicking the picture through the smartphone. The picture was created using Photoshop and was pasted behind a Koko Krunch box for testing and survey.

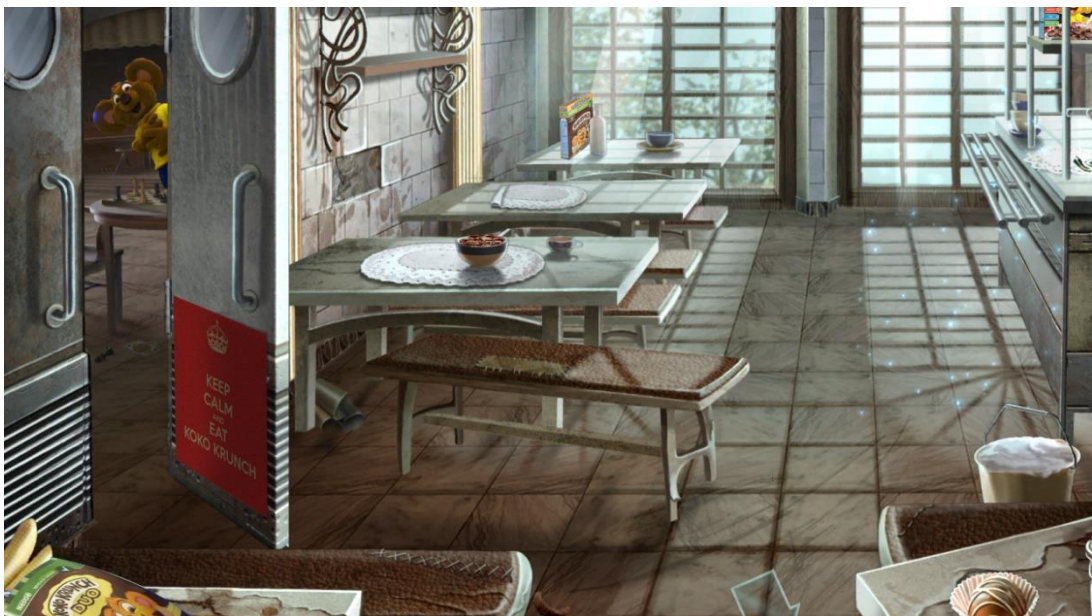


Figure 7: Picture with hidden items for augmented reality game

Users must give permission for the app to access their twitter account in order to play the game. After giving the permission, users can play the game by clicking on the hidden objects seen through the smartphone.



Figure 8: Finding hidden Koko Krunch related items

The game will capture the time taken by the users to complete the game. The time taken will be the score of the users. And this score can be posted in their twitter to be boasted and the tweet will be seen by all of the users' followers.



Figure 9: Twitter sharing button

The app then will post a tweet using the users' account to notify their followers about the game.



Figure 10: score tweet generated from the app

3.2.4 Implementation Phase

Evaluation Method – the evaluation of the research is done in two ways. The first one is by doing social media experiment. Social media experiment was done by selecting six avid twitter user with more than 500 followers to play the game and share their score on their respective account. Any interaction regarding the game is recorded and questionnaire is given to people that are interested on the game. 30 people from social media experiment was chosen and their answers from the questionnaire was recorded.

The second evaluation is done by doing a survey and questionnaire to public citizen. It is done by giving out the prototype for public to try and questionnaire was given to them. The same questionnaire was also given to them. Around 30 people was chosen from public survey and their answers from the questionnaire was recorded.

3.1 Tools

Hardware

Development Machine Specification (Custom AMD Desktop)

- Processor - AMD A10-5800K APU with Radeon HD Graphics (3.80GHz)
- Video Subsystem – AMD Radeon HD 7700 Series
- RAM - 12.00 GB of DDR5 166 mHz memory.
- Platform - Microsoft Windows 8.1 Ultimate (64-bit)

Target Machine Specification (OPPO Find 7a)

- Chipset - Qualcomm MSM8974AB Snapdragon 801 Quad-core 2.3 GHz Krait 400
- RAM – 2 GB
- ROM - 16 GB
- Platform – Oppo ColorOS Android 4.4.2 (KitKat)
- Camera - 13 megapixel with autofocus and flash
- Internet – LTE 4G, 3.5G, 3G, GPRS, EDGE, Wi-Fi

Android Development Environment

Android SDK:

- The plug-in provided in Android Software Development Kit (SDK) assists in invoking .apk archive file to enable the .apk archive file running without using the real smart phone. It is also very useful in retrieving the warnings and errors through the Android Logcat. [6][9]

Augmented Reality Development

Qualcomm Vuforia (QCAR)

- QCAR is AR framework for Android. It handles everything related to AR in Android by using the predefined methods, algorithms and libraries developed by Qualcomm Developer Network or QDevNet

Graphic Development

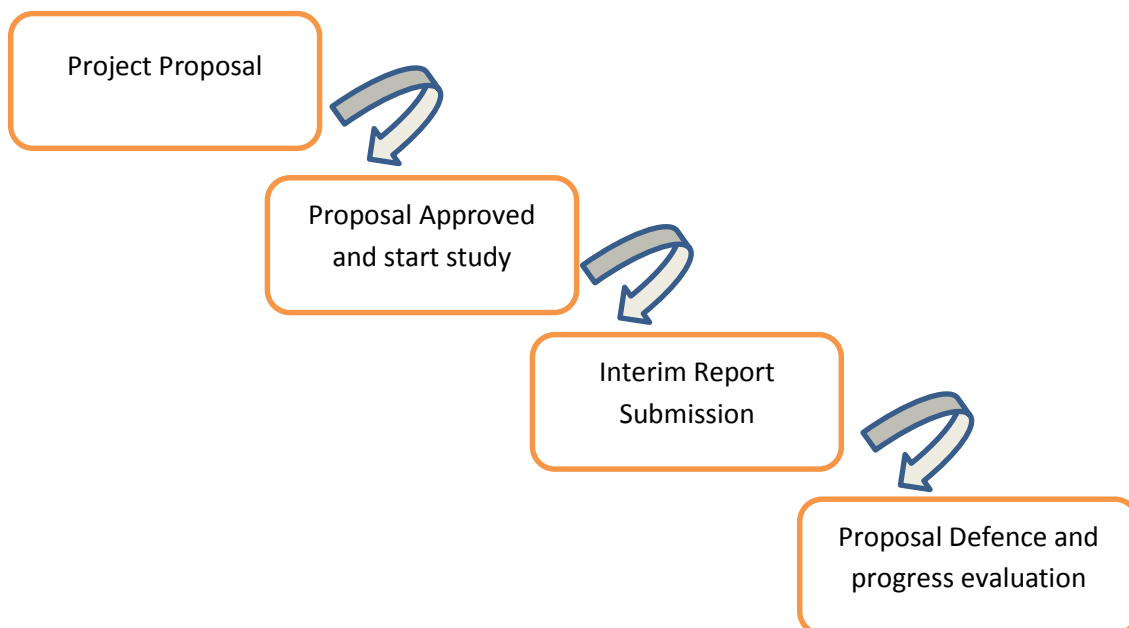
Adobe Photoshop

- Photoshop was used to alter certain pictures so that hidden items can be put into the picture. Any alteration can be done easily using Photoshop as long as it is in the picture dimension.

Unity 3D Pro

- The software is used together with the QCAR framework as the extension. Object created from Maya will be posted to Unity and AR scene will be created there. The development environment runs on Microsoft Windows and support several output including for Android, iPhone, Wii, PlayStation 3, Xbox and the others. This is where most parts of the application being developed.

3.2 Key Milestone and Gantt Chart



No	Details/week	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Project Work Continues														
2	Submission of Logbook														
3	Project Work Continues														
4	Pre-SEDEX														
5	Submission of Technical Paper														
6	Submission of Dissertation														
7	Oral Presentation														*
8	Submission of Dissertation (Hardbound)														

4. CHAPTER 4: RESULT AND DISCUSSION

This chapter discussing on all of the results collected from most of the phases in the system development process. The result helps to support the evidence towards achieving the objectives together with the discussion. This chapter will describe on several main aspects mentioned below.

- Survey data collection and analysis
- System and software architecture
- Challenges and solutions

4.1 Survey data collection and analysis

From the evaluation method, we gather questionnaire surveys of 60 people using 30 direct questionnaire and 30 from social media experiment. The questionnaire can be seen in the appendix. The questionnaire were only given to people that are interested to know more about Augmented Reality and interested to try the game.

From the survey, we gathered answers from people of various ages. 63.33% of the respondents are male and 36.77% of them are female. From the data from the survey, we get that most of the people interested in the new type of advertisement are coming from the range of 25-35 years old.

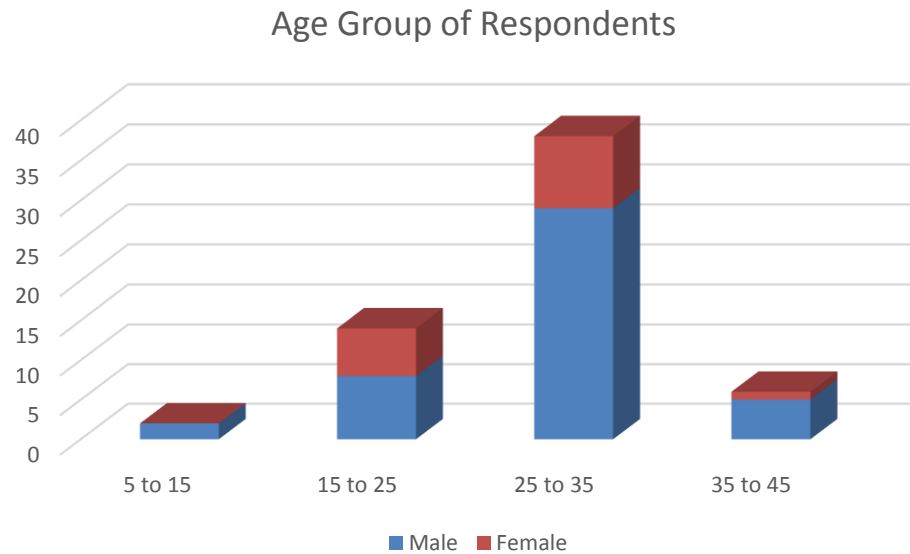


Figure 11: Age Group of Respondents

From the survey questions of Q1, Q2 and Q3, we can see that from 60 people that are interested to try the game, 38 of them coming from the age group of 25 to 35 years old. 18 of them coming from the age group of 15 to 25 years old. 2 are from 5 to 15 years old and 6 are from 35 to 45 years old.

This is because most of the people from the age range of 25-35 are the ones that are interested in new technologies. Other than that, people from this age group also are mostly normal workers that eat cereal as their breakfast choice because of their busy life and other kind of breakfast and also buying food from stalls are time consuming.

All of them are users of smartphones but since the app developed for this project only available on Android platform, all 30 respondents from social media experiment are users of Android phones. For random survey evaluation, people are using the developer's phone to operate the app because it is easier for them to try the app without having to install the app into their phones.

For Question number 4, we asked the respondents on their knowledge about augmented reality.

Q4: do respondents have prior knowledge of Augmented Reality

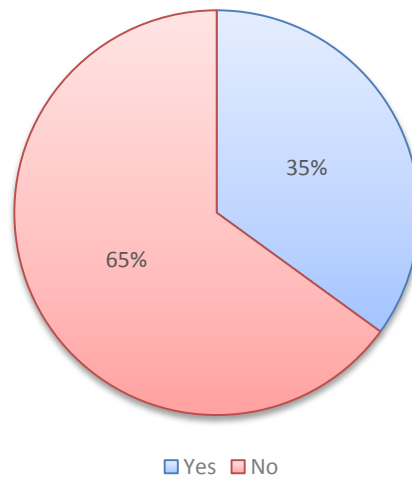


Figure 12: Do respondents have prior knowledge of Augmented Reality

From Q4, we get to analyze that only 35% or 21 of the respondents from 60 have prior knowledge about Augmented Reality and almost all of them get the idea of Augmented Reality from PlayStation Robots display.

From this analysis we can say that even though there are many researches done for augmented reality, people in Malaysia are still oblivious about the technology and they are all interested in this new kind of gaming and advertising experience.

Moving to the next question, in question 5 and 6, respondents were asked about their consumption of cereals. In Q5 we asked them if they are regular consumer of cereal, and from the analysis we get that only half of them are regular consumers of cereal. Other than that, the users also consume cereals but not as often.

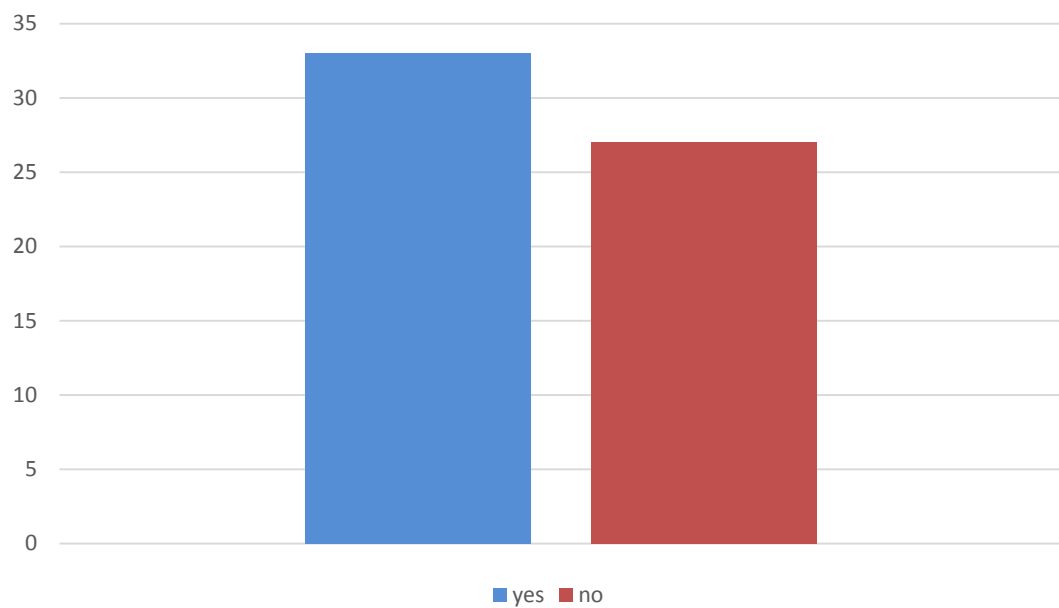


Figure 13: Are the user regular consumers of cereals?

For Q6, we asked them all and even though if they are not regular consumers, if they have to buy cereal, what kind of cereal they will buy.

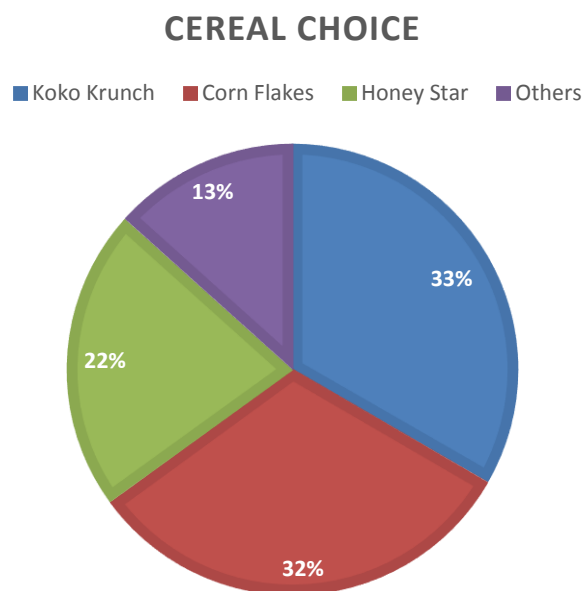


Figure 14: Cereal choice of respondents

From the analysis we found out that 33% of the 60 respondents are fans of Koko Krunch and this is the most famous cereal among them. 32% of them are regular customer of Corn Flakes. We also can see that 22% of the 60 are fans of Honey Star and the rest of them choose other kinds of cereal.

From this analysis we can see that even though Koko Krunch is the most famous cereal among them all, the difference between them is so small and insignificant.

This is when we asked them to play the game and try the Augmented Reality experience as our way to promote Koko Krunch and we are hoping for them to agree to buy Koko Krunch. After finishing the game, they were asked to complete the questionnaire.

From Q7, we asked the respondents that in the scale from 1 to 5, how willing are they to buy Koko Krunch to play the Augmented Reality game being that the scale 5 is very willing to buy and 1 being the least willing to buy. And the result is shown below.

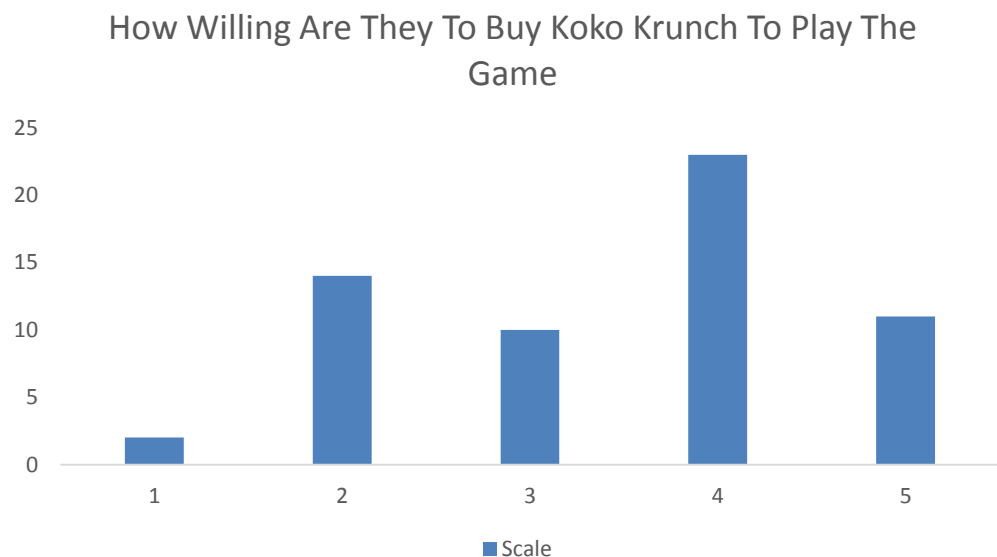


Figure 15: How willing are they to buy the product to play the game

From the analysis, we can assume that respondents who respond by the scale 3 and above are willing to buy the product and they are consisting of 73.33% of the total number of the respondents. That is an increase by a lot because in previous question, only 33% of them are regular consumers of Koko Krunch.

In Q8, the question is asking the respondents whether they are going to suggest the game to other people or not based on the experience of playing the Augmented Reality Game. The result is shown below.

ARE THEY GOING TO SUGGEST THE PRODUCT TO FRIENDS?

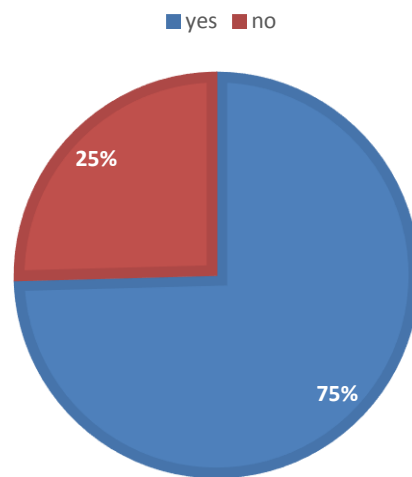


Figure 16: Are they going to suggest the game to friends

From this question, 44 from the 60 respondents said that they are going to suggest the game to their friends because it is a new kind of technology and it is fun to play with people especially since they can boast their score in their social media account.

However, 16 of the respondents responded by saying that they did not see the value of the game yet. They agree that it is fun but since people need to buy the product to play the game, the game needs to have a certain value to attract people. Most of them saying that other than boasting the score in social media, there is nothing else that this game can give to them.

Moving to Q9, the respondents were asked about their willingness to share this game and their score into their own social media account. This question was asked so that we can see whether this game is going to do self-promotion in social media or not. And their responses are recorded as below.

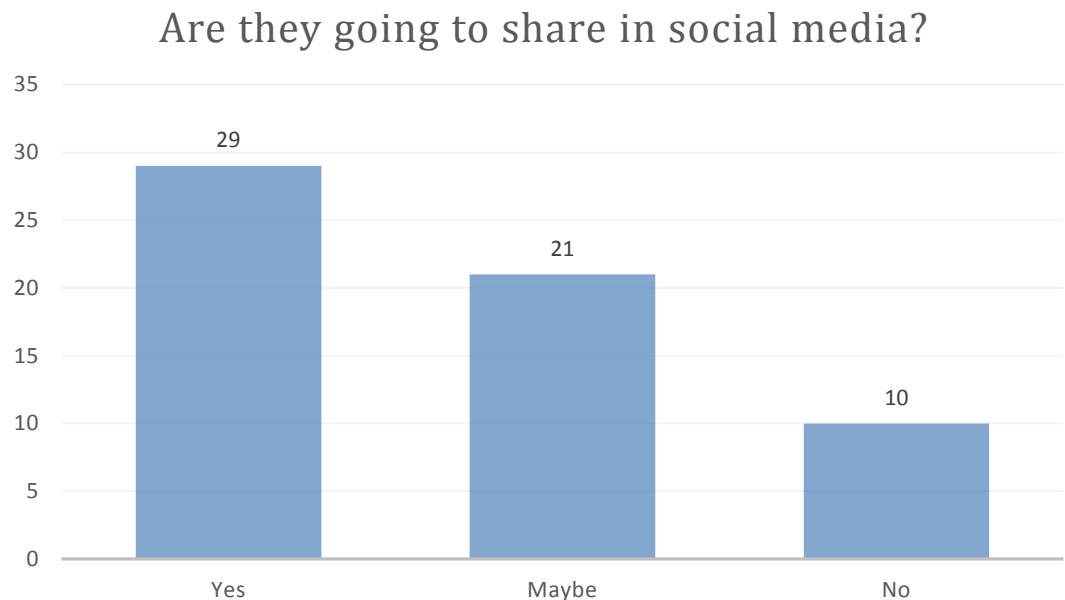


Figure 17: Are they going to share in social media?

From the analysis, we can see that 29 of the 60 respondents are willing to share it in their social media account. This is mainly because they want other people to try the game because of the new kind of experience. 21 of the 60 selected Maybe and this is because they are not an avid user of social media. They said that maybe the game can be shared to other social media platform too then they will share. Since the game for now only can be shared to Twitter, they are not interested to share because they are not avid twitter users. And the last 10 are saying that they are not going to share because they do not use social media.

According to Q10, we asked them about the latest trend of social media sharing for games. We asked them are they familiar with the tweets about people playing Flappy Bird and Temple Run boasting their scores through Twitter. Most of them are familiar with the idea but only some of them are doing it by themselves. So in this question we asked them that according to recent trend of gaming promotion through

social media, do they think that their friends in social media would buy the product to play the game. The result is shown below.

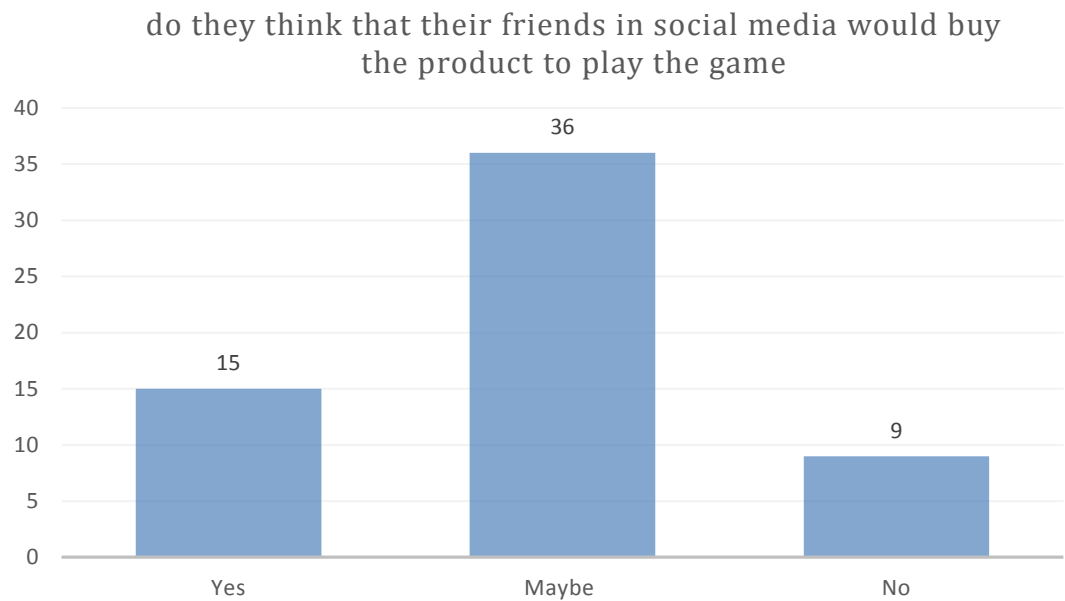


Figure 18: do they think that their friends in social media would buy the product to play the game

From the analysis, we can learn that only 15 people from the 60 said that they are confident that their friends in social media will buy the product to play the game. The highest number of answers went to Maybe since 36 people are saying that even though the game is interactive and fun, they still have to buy the product to play the game and there is no reward system. Different from Flappy Bird and Temple Run because those games are free and available in the app store. And 9 people from the 60 respondents said that people are not going to buy the product just to play the game.

And in question number 10, we asked the respondents on the attractiveness of the game solely according to their experience. We also asked them about the user-friendliness of the app. This is important because we can see that beautifully developed games normally will attract more players and well-crafted app will help it to be more user friendly and it is important in attracting customers too. The result is shown below.

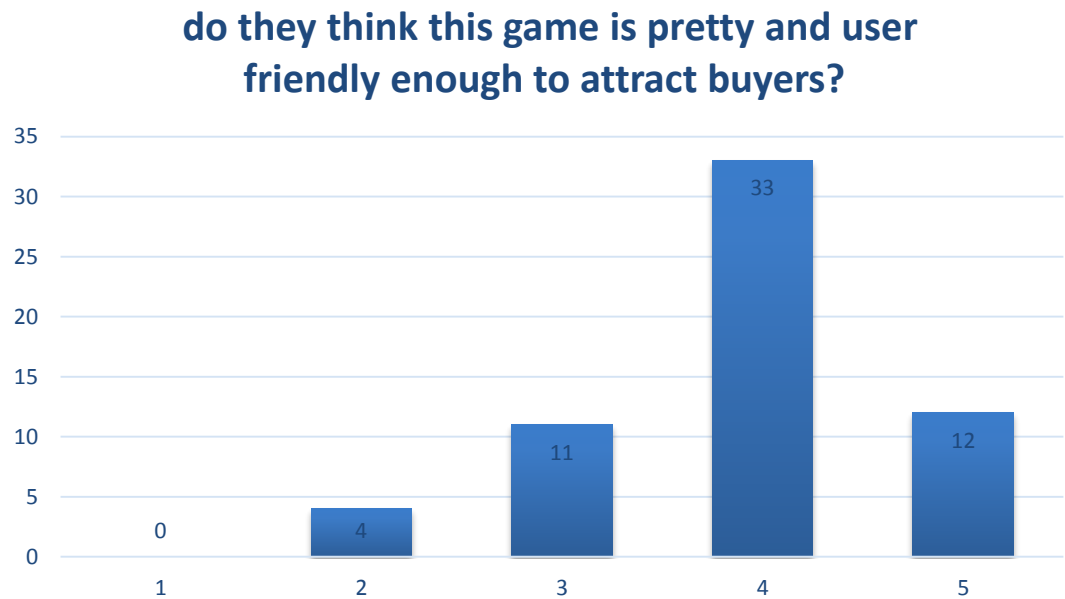


Figure 19: do they think this game is pretty and user friendly enough to attract buyers?

From the analysis, we can see that most of them stated that the game is pretty and user friendly, but there are many improvements that can be done here and there to make sure that it can attract more customers. 33 people out of the 60 thinks that the game is pretty enough to attract customers but are not giving the scale of 5 because they think that there are some improvements to be made. 12 people said that the game is attractive and they had fun trying it. 11 people out of the 60 chose the scale of 3 because they think that as a game that have to be bought, it has to be prettier and should have more functions. And the other 4 chose the scale 2 because they said that the game is too simple.

And for the last question, we asked the respondents whether the Augmented Reality Technology are effective in doing promotion for a product. We also asked them whether the inclusion of social media will help the marketing of a product based on their observation and experience. The result are shown below.

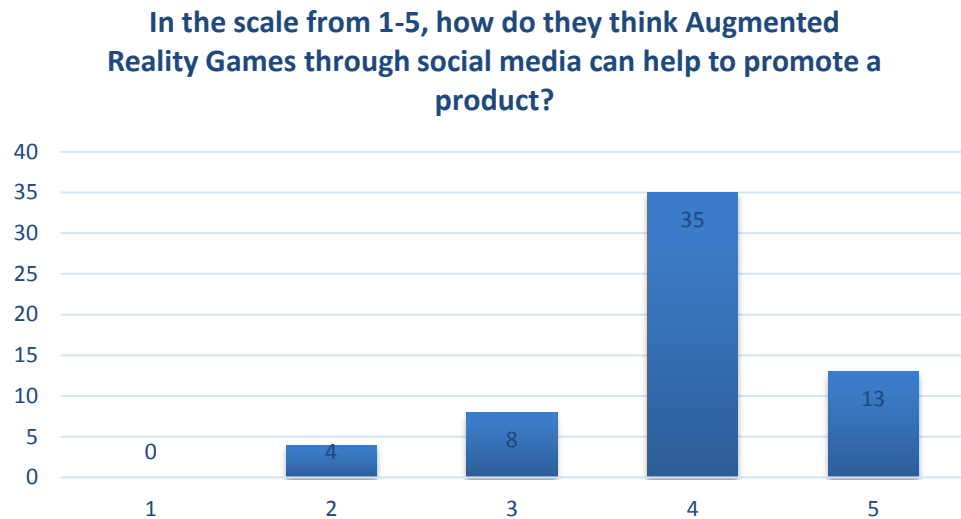


Figure 20: In the scale from 1-5, how do they think Augmented Reality Games through social media can help to promote a product?

From the analysis, we can see that 4 out of the 60 respondents are saying that using augmented reality and social media to promote a product is only at the scale 2. This is because they said that people are still not familiar with the technology and it will takes time and more effort to get Augmented Reality and promotion to work.

8 people from the 60 respondents chose the scale 3. Most of them also stated that while the game is fun and the experience is new, it is still hard to do promotion like this because people have to pay to play the game. They also suggested that the game can be put elsewhere first just to give the consumers the gist of the promotion before they need to buy the product to play the game.

35 people out of the 60 respondents chose the scale 4 because they think that with the new and interactive type of advertisement, people are going to be interested in physical advertisement again. And inclusion of social media will help the game and the product to do self-promotion which will help the growth of the brand too. Judging from how people are always doing online business and online shopping using social media these days, it is going to be a very effective way to do business.

And 13 out of the 60 respondents chose the scale 5 because for them, they Augmented Reality advertisement is the best way to do promotion since people can interact with it and it will leave more impact than old advertisements.

4.2 System and software architecture

For the system to flow smoothly, it is important for the end user to know how to work the application from the first time that they see it until they close the application.

First of all, when the customer buys the product, they will be given a notice at the packaging that the packaging is embedded with the augmented reality technology and they must be able to download the application. In order to do this, the developer can generate a QR code that will lead the user to Google Play and download the application. The .apk file can also be retrieved from a host where users can download it from their computer and push it to their smartphones to be installed.

After the installation, the user is now available to start the application by pointing the camera to the packaging and they should be able to interact with the program and also playing games while they are in it. There are interactive buttons that will redirect user to the website of the developer, the website of the product, and also their Facebook and Twitter accounts. The user will also be able to drop any comments if needed.

The game played by users can also be shared through social media. The score of the game will intimidate other people who saw the shared advertisement in social media. Competitive nature of today's mobile games will help indirectly promoting the brand and also making other customer to purchase the product to get the taste of the competition.

4.3 Challenges and solutions

Along the development, there are some challenges faced by author in completing the AR app.

The first one is the author found out that the Personal Computer used is not capable of doing 3D modelling and also the challenge of getting the right software for the development. In order to overcome the challenge, the author upgraded the computer and also enquire senior students and also post-graduate students for the advice on the software needed. As the result, doing 3D modelling is no longer a challenge.

Second challenge is the difficult process of making a 3D modelling has made the author revised and changed the plan from making a complex game to a just simple game that shows a very simple concept of Augmented Reality. This is after getting an advice from a senior doing the research in the field.

Third challenge is the changes of schedule making the author felt the need to complete the app and the game in a rush. The first prototype was sloppy and as the result, Pre-SEDEX was almost a disaster. But the author managed to retouch the app to make it more proper by getting help from seniors and friends.

The Fourth challenge was the breakdown of the device to test the app. The phone and tablet used to operate the app during the survey broke down. The camera was not focusing properly and the image scanned was blurry. Luckily people still can see the images and play the game. The author also need to repair to phone before continuing the survey.

5. CHAPTER 5: CONCLUSION AND RECOMMENDATION

As the conclusion, from the studies done on the topic, it is possible for augmented reality advertisement to increase the sale of the product. And inclusion of social media into the equation will help spreading the name of the brand more rapidly than current AR programs. The more interesting and interactive advertisement will also help people spend more time with the product and will leave a memorable impact. Furthermore, competitive nature of today's mobile games will also help the promotion of the brand since more people will be buying the product to compete with their friends in social media.

For future works, it is better for the AR application to be compatible with other mobile operating systems too so that other users other than android can have the same experience with their friends with android smartphones. For the moment, putting an app in Apple Store is kind of pricey so it is hard for the author to cater to Iphone User. For future development maybe this app can be put into Apple App Store.

It is also recommended for developers to create more engaging and more complex games with better animation and graphics. In another perspective, the more pretty the animation is, the more interesting it will be. So in order to attract more customers, the app should be able to produce high quality graphics so that it will satisfy and attract the users. Other than that, people will also not get bored from playing the same game over and over again.

Other than that, since people in the survey did touch about the reward system, it is very recommended if the owner of the product or in this case Nestle can provide reward for people with the highest score maybe once a week or once a month. This will attract more players to play the game and subsequently buying the product to increase the sales of said product. The reward system can be done in a leaderboard system. Where a real time leaderboard is created so that people can play and see their scores and ranking in the board. This will also increase the competitiveness of the players.

Last but not least, since right now the app can only be shared through twitter, it is better if it can also be shared on other social media networking sites such as Facebook, LinkedIn, MySpace and many more. This is because different people prefer different social media networking. Facebook is a social media site with the largest number of users right now. So it is better to share the game there to make sure more people are reaching the app and also the game.

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[22]

Augmented Reality in Marketing

Q1: What is your name?

Q2: Your age?

Q3: Your occupation?

Q4: Do you have any prior knowledge about Augmented Reality?

- ☐ Yes
☐ No

Q5: Do you eat cereals often?

- ☐ Yes
☐ No

Q6: If you want to buy cereal, what kind of cereal do you eat the most?

- ☐ Koko Krunch
☐ Honey Star
☐ Corn Flakes
☐ Others

Q7: After playing the game, in scale of 1-5, how willing are you to buy Koko Krunch to play Augmented Reality games?

1 = Strongly Disagree . 5 = Strongly Agree

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5

Q8: Would you suggest your friends to buy the product to play the game?

- ☐ Yes
- ☐ No

Q9: After playing this game, are you going to share this app to your social media friends?

- ☐ Yes, i am going to share
- ☐ maybe
- ☐ No, i am not going to share

Q10: According to recent trend of gaming promotion through social media, do you think your friends in social media would buy the product to play the game?

- ☐ Yes
- ☐ Maybe
- ☐ No

Q11: In the scale of 1-5, do you think this game is pretty and user friendly enough to attract buyers?

1 = Strongly Disagree . 5 = Strongly Agree

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5

Q12: In the scale from 1-5, how do you think Augmented Reality Games through social media can help to promote a product?

1 = Strongly Disagree . 5 = Strongly Agree

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5

Q13: Why?

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